A person wearing a cap and a high-visibility vest is standing in a field of tall grass and brush. They are holding a clipboard and looking down at it. In the foreground, there is a yellow bucket and some equipment. The background is filled with dense vegetation.

Integration of Surface Water and Landscape Data from EMAP West - Prediction of Total Phosphorus in Oregon

John L. Stoddard
U.S. EPA, Corvallis

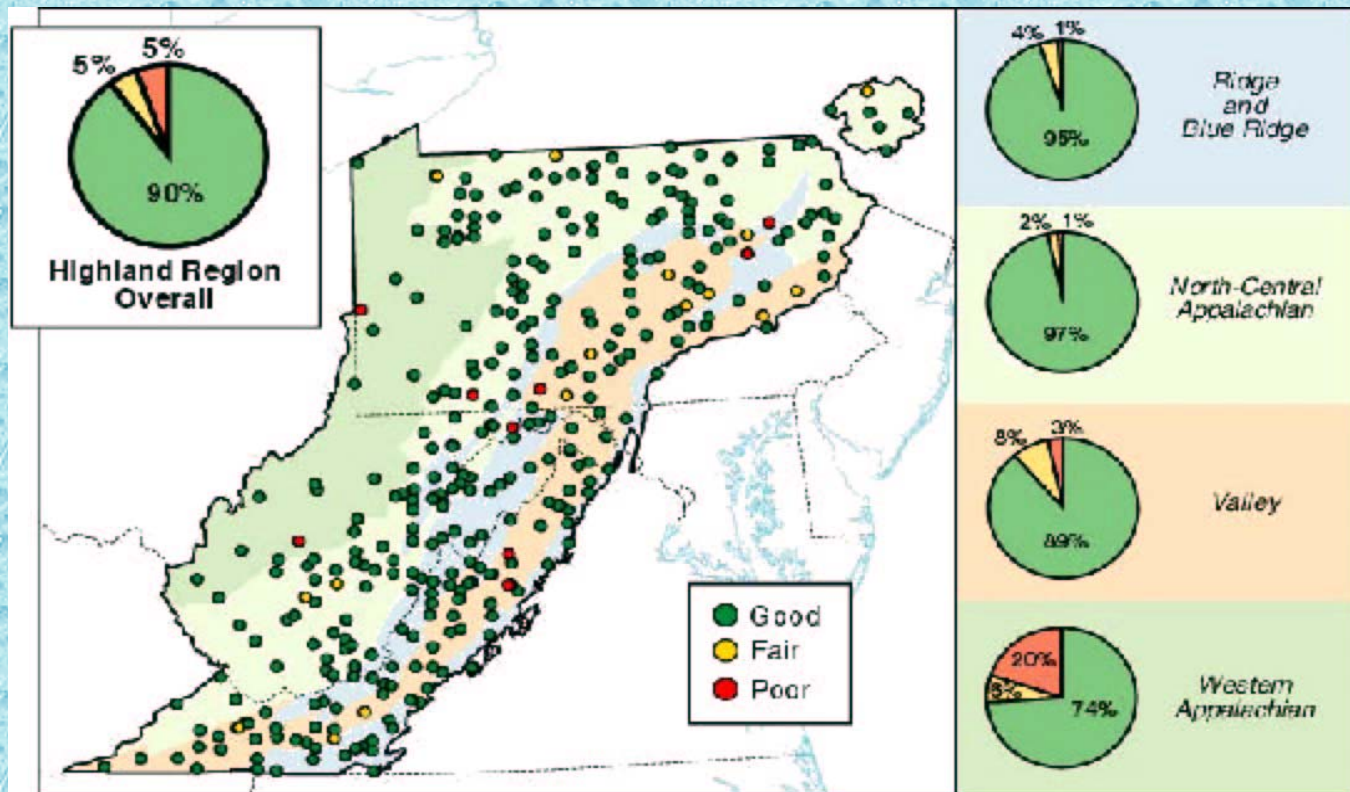
Daniel T. Heggem
Anne C. Neale
U.S. EPA, Las Vegas

EMAP's Focus -

Primary: How many are there?

Secondary: Why are they?

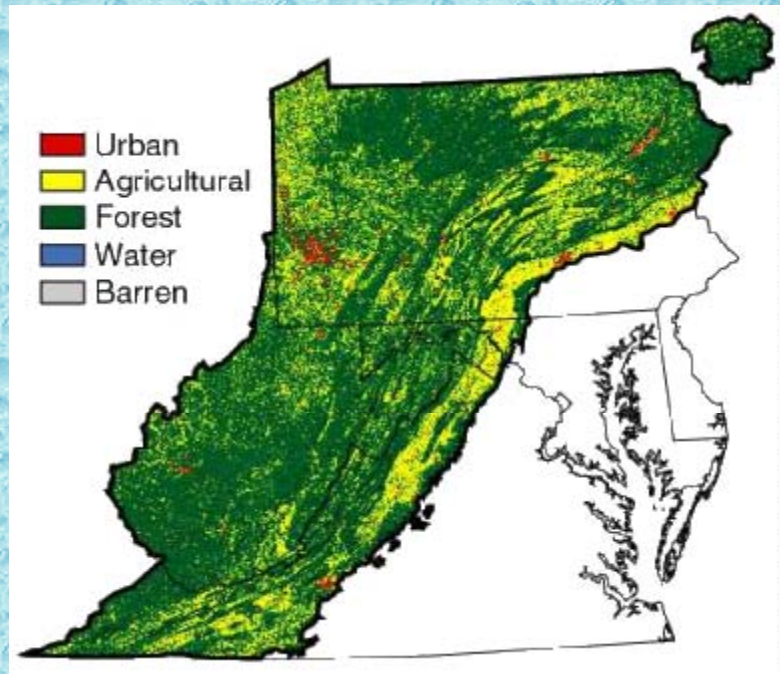
What about where are they?



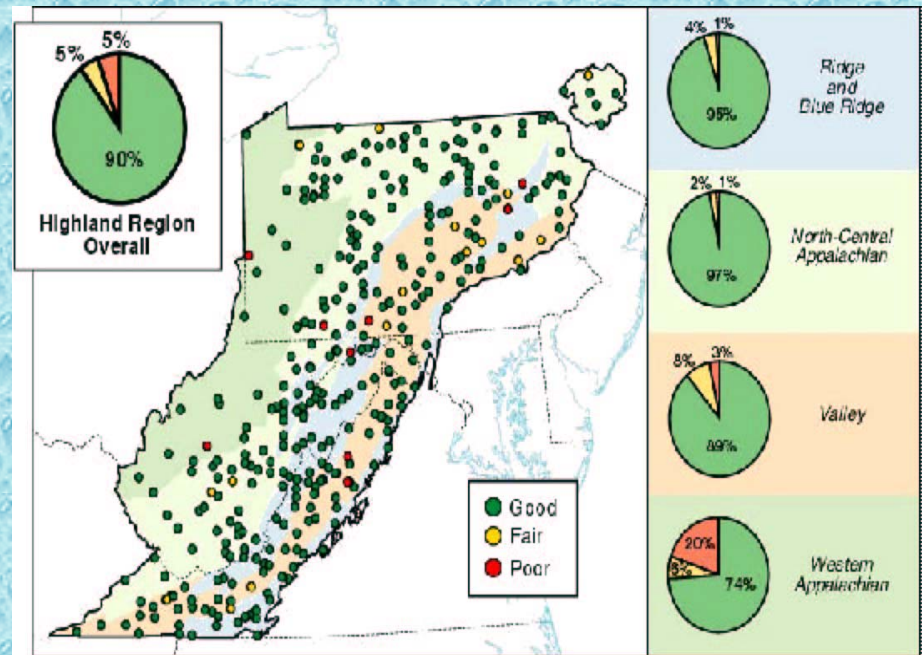
Example: Phosphorus results for Mid-Atlantic Highlands

EMAP's Future?

Can we do more by integrating landscape and surface water data?



+



= ?

Oregon EMAP Data Sources

Coast Range REMAP Project (1994-96)

- 59 streams

Oregon EMAP Pilot (1997-98)

- 168 streams and rivers

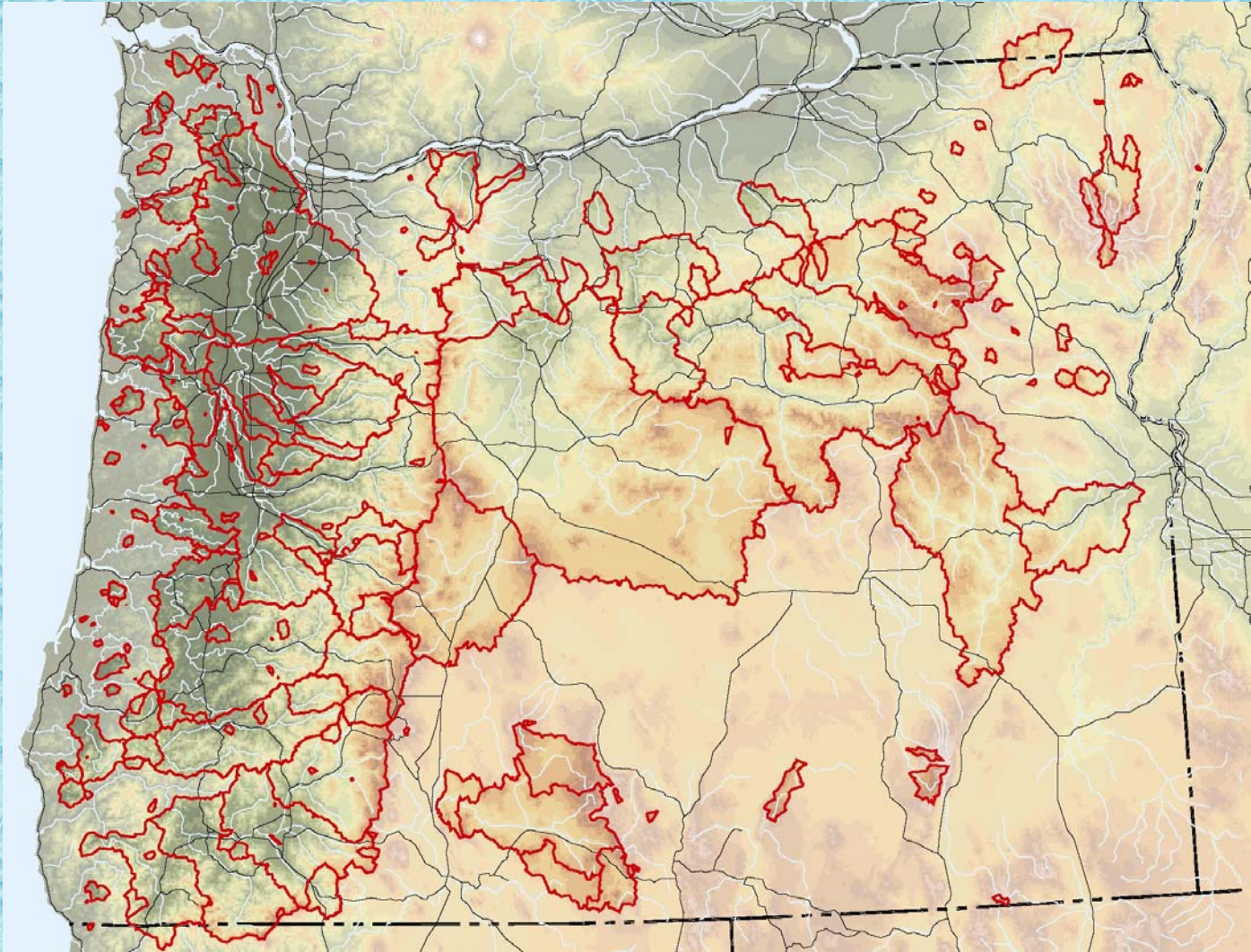
EMAP-West Year #1 (2000)

- 73 streams and rivers

Upper Deschutes REMAP Project (1997)

- 27 streams

Oregon EMAP Data Sources



ca. 300 stream and river watersheds

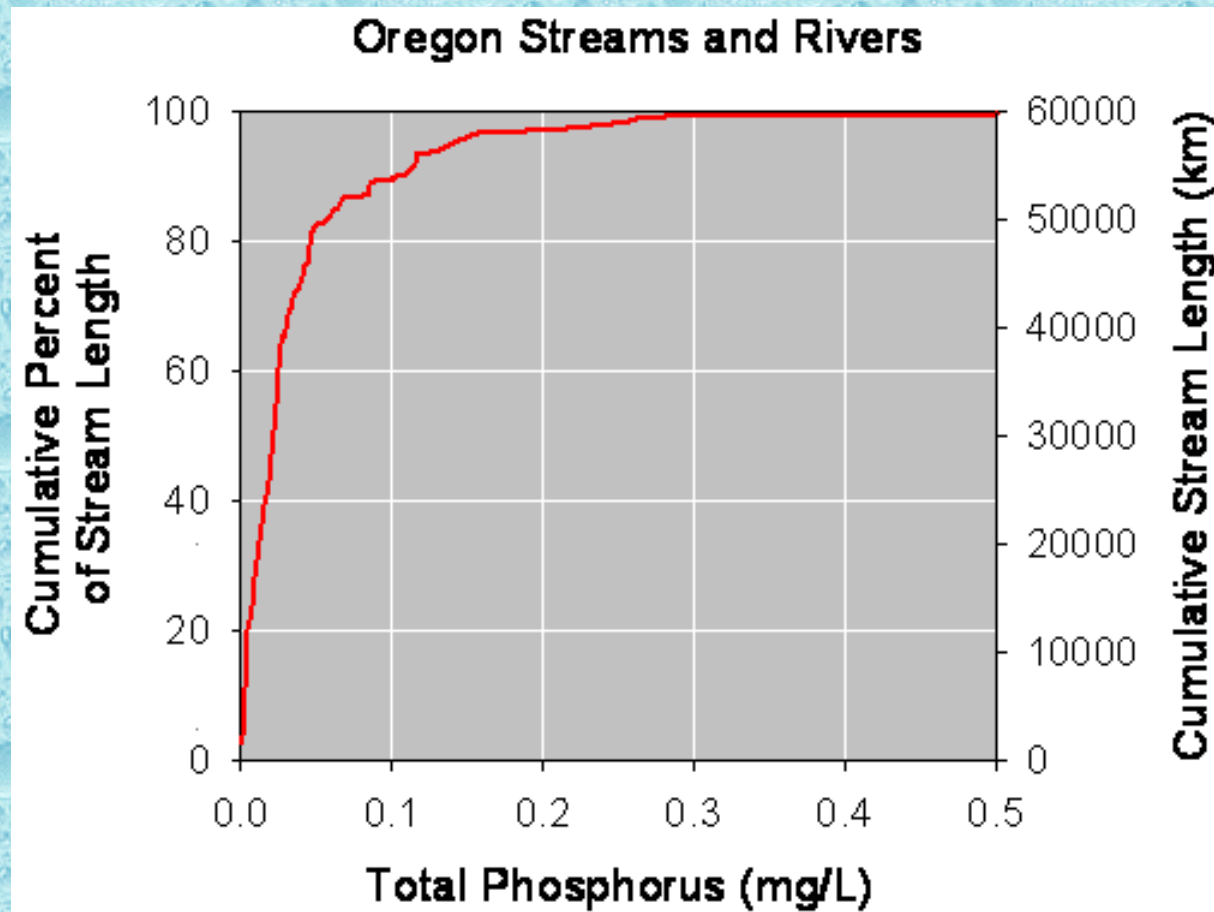
Oregon Landscape Data



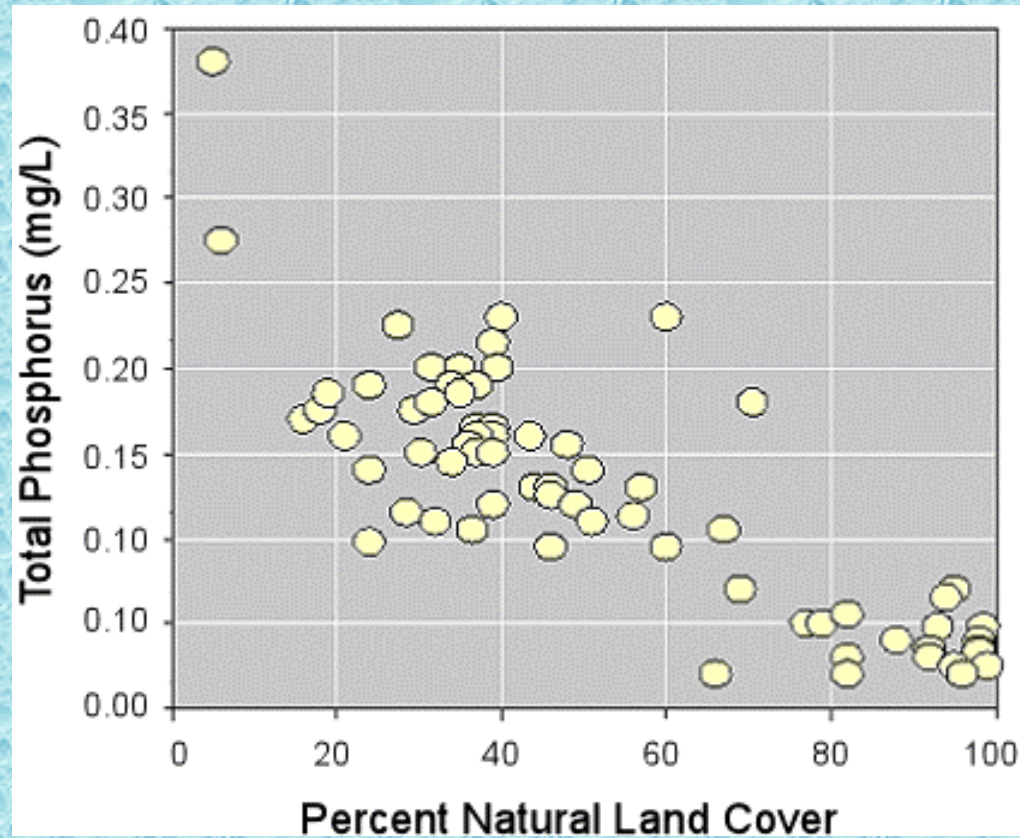
Land Cover Classes

Open Water	Transitional	Pasture/Hay
Perennial Ice/Snow	Deciduous Forest	Row Crops
Low Intensity Residential	Evergreen Forest	Small Grains
High Intensity Residential	Mixed Forest	Fallow
Commercial/Industrial/Transportation	Shrubland	Urban/Recreational Grasses
Bare Rock/Sand/Clay	Orchards/Vineyards/Other	Woody Wetlands
Quarries/Strip Mines/Gravel Pits	Grasslands/Herbaceous	Emergent Herbaceous Wetlands

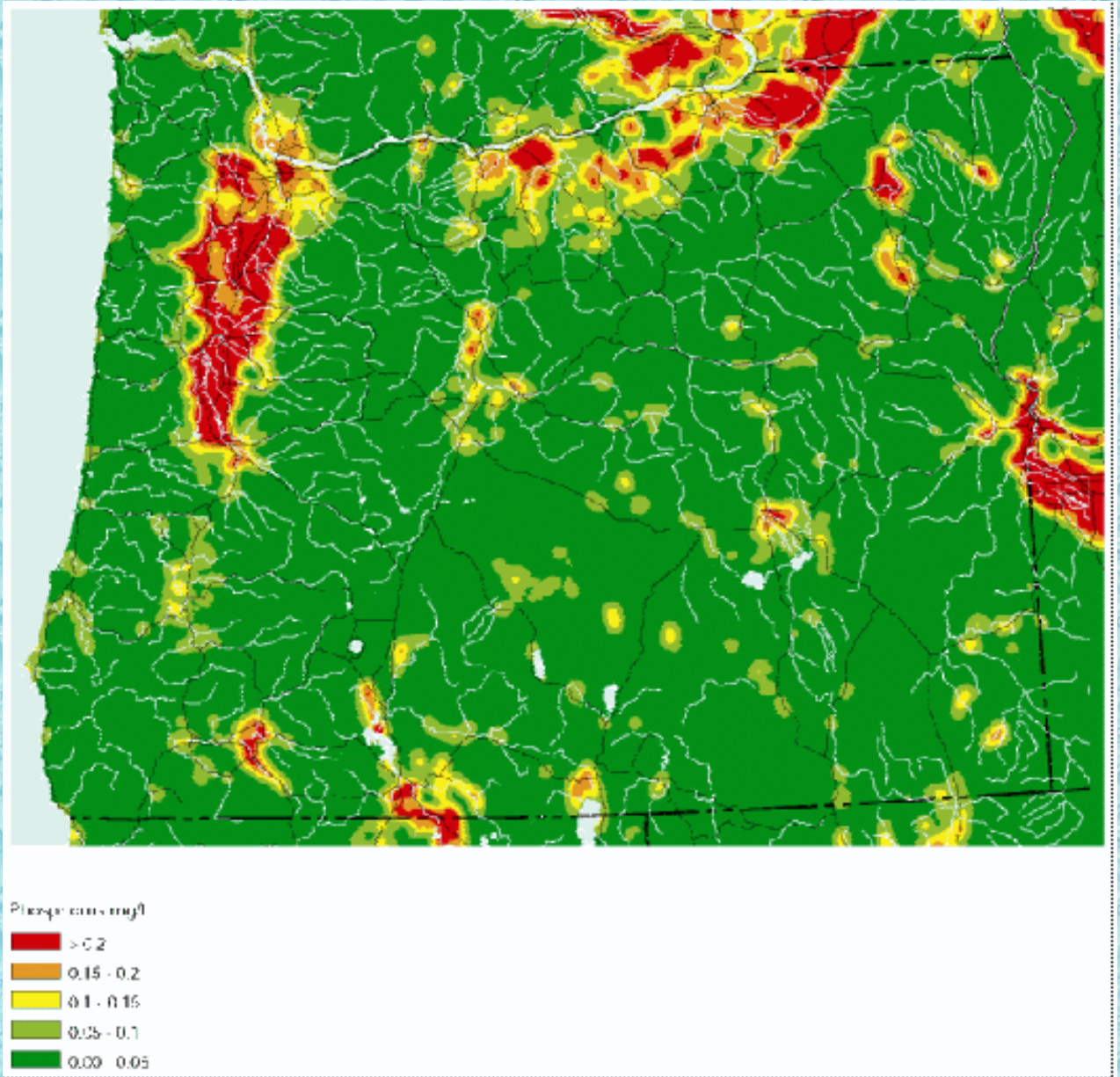
Oregon Total Phosphorus Distribution



Relationship of Phosphorus to Land Use



Predicted Phosphorus in Oregon Streams and Rivers



Draft Aggregation of Level III Ecoregions for the National Nutrient Strategy



Ecoregion-Specific Phosphorus Models

Western Mountains:

Total Phosphorus "

- riparian shrublands
- riparian urban landuse
- riparian cropland

(n = 103, $r^2 = 0.57$)

Xeric West:

Total Phosphorus "

- % forest in watershed
- riparian urban landuse
- riparian shrublands

(n = 39, $r^2 = 0.47$)

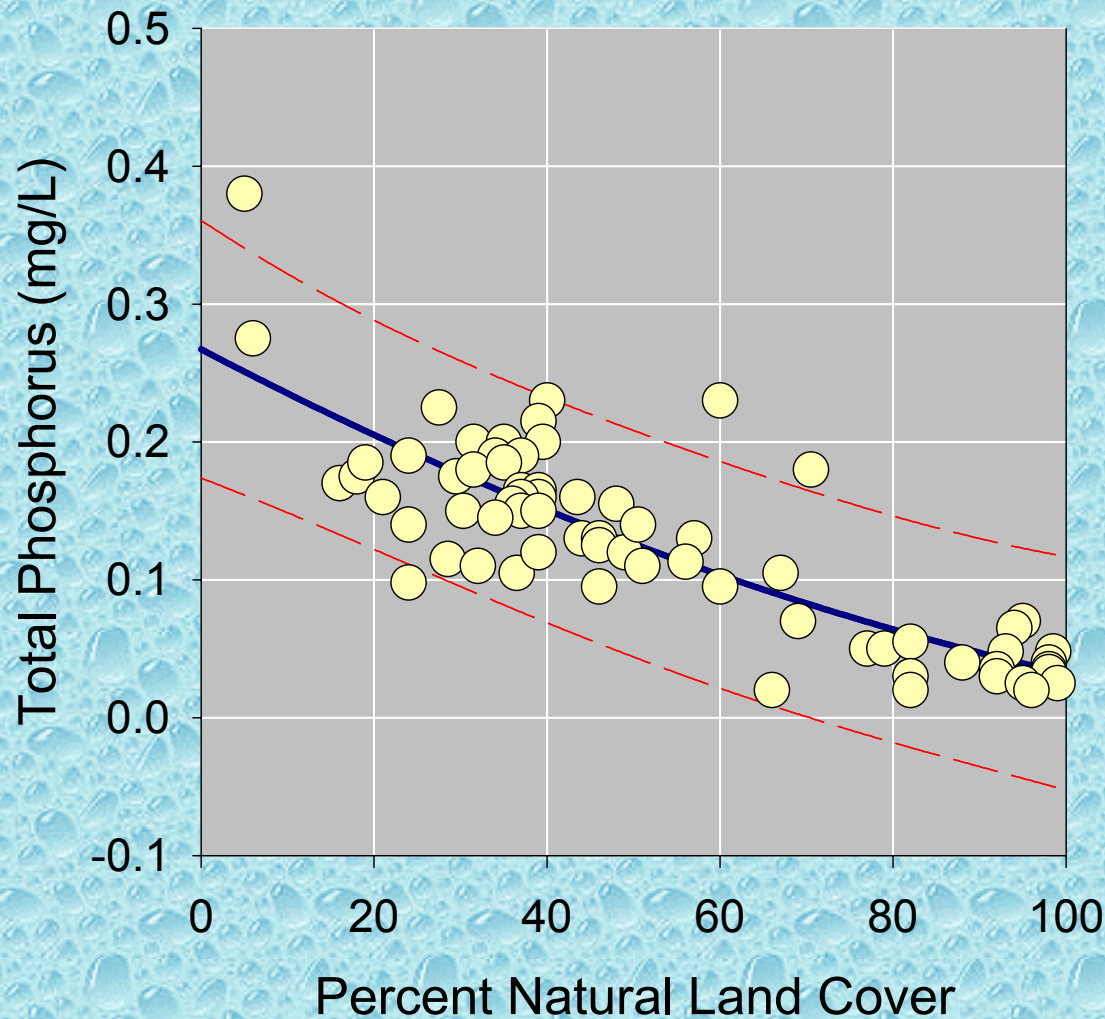
Willamette Valley:

Total Phosphorus "

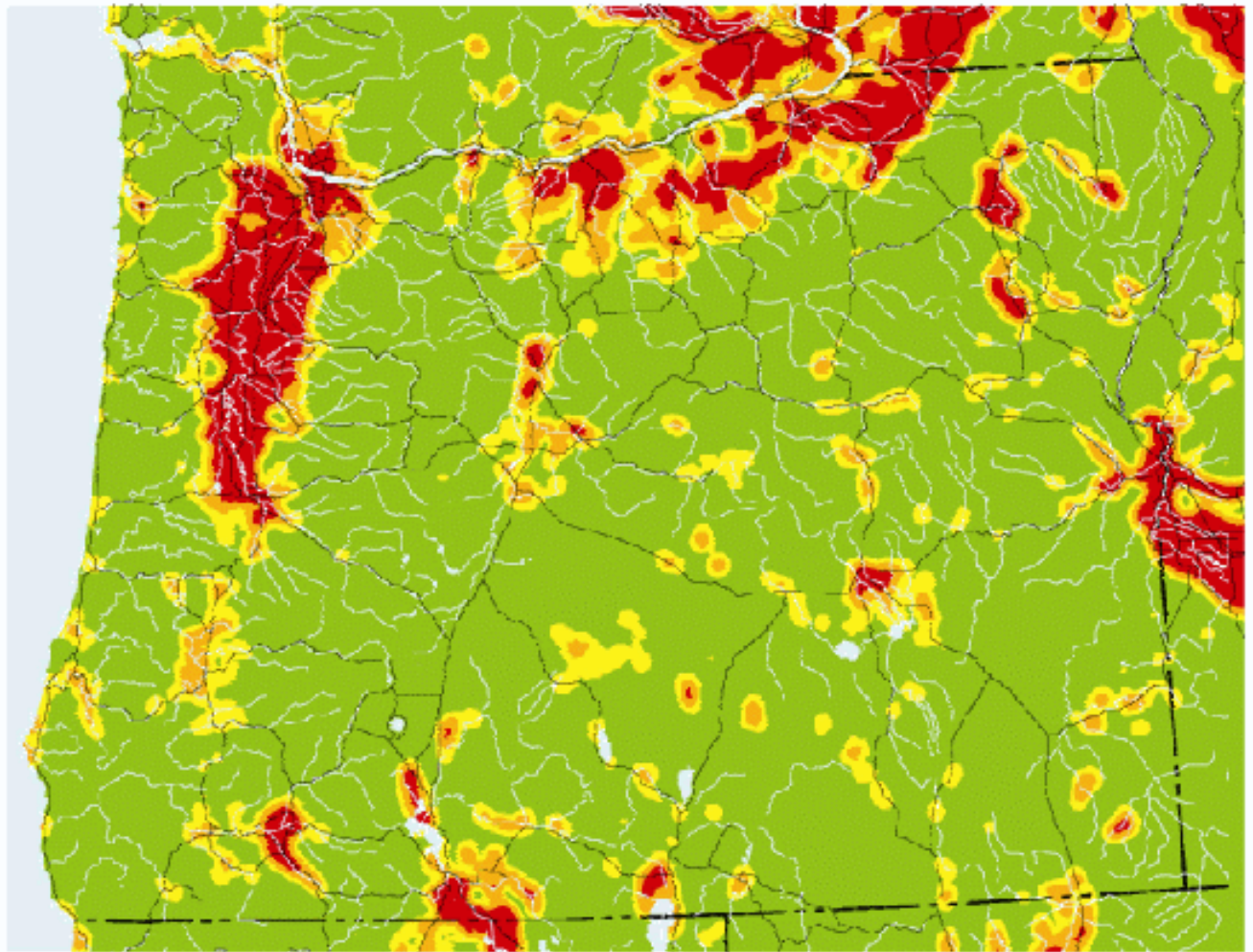
- riparian cropland
- riparian urban landuse

(n = 25, $r^2 = 0.86$)

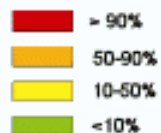
Expressing Predictions as Probabilities



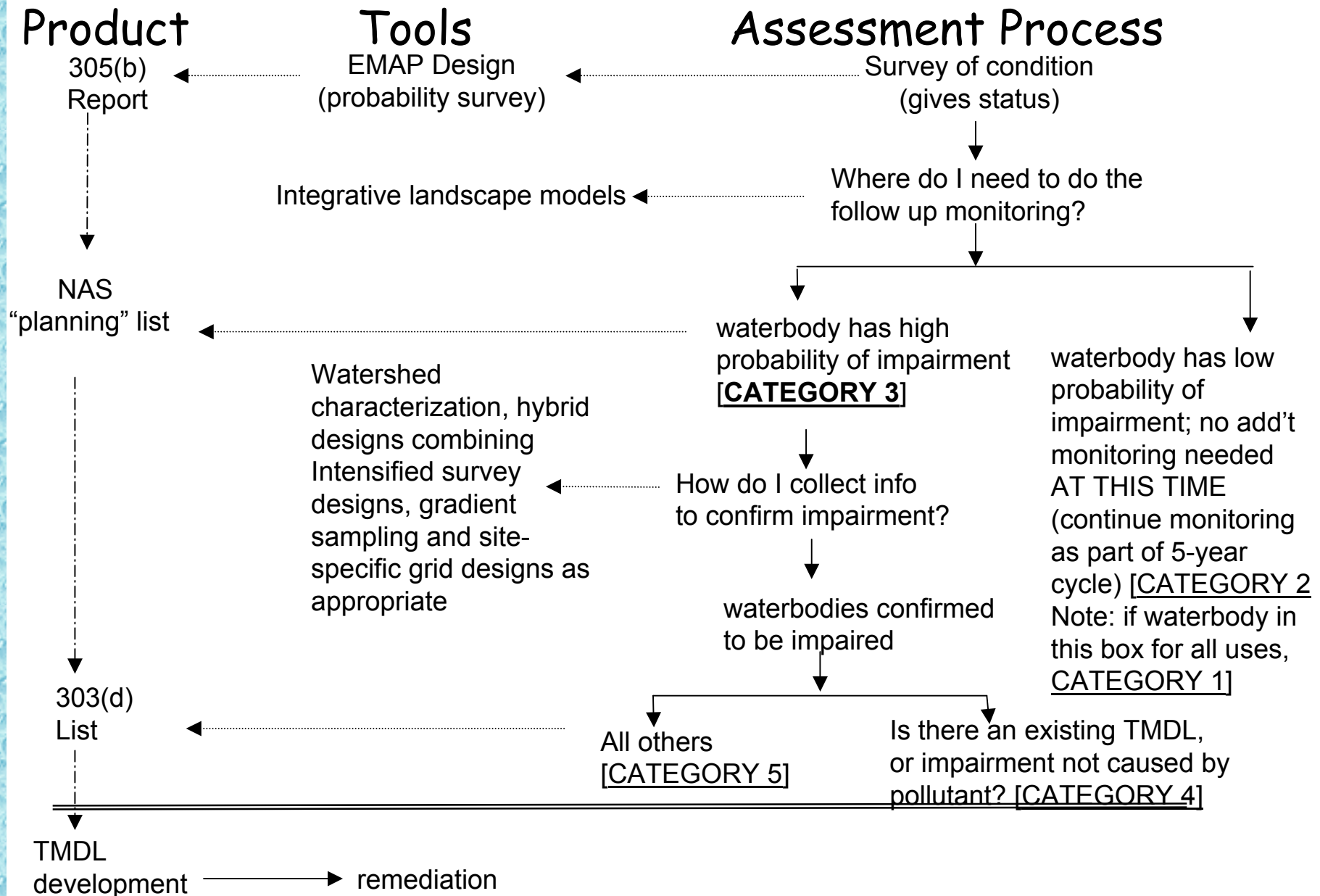
Probability of Exceeding $100\text{ }\mu\text{g/L}$ Phosphorus in Oregon Streams and Rivers



Probability of Exceeding 100 mg/l



Integrated 305b/303d Monitoring Design



What's next - other variables

Other stressors:

Total Phosphorus

Total Nitrogen

Dissolved nutrients (e.g., ammonium)

Excess sediments

Tissue contaminants

Stream temperature (??)

How to extend to biological variables?